

§ 25.601

(c) For nonmetallic components, compliance with paragraph (a) of this section may be shown by—

(1) Designing the components to minimize the effect of a strike; or

(2) Incorporating acceptable means of diverting the resulting electrical current so as not to endanger the airplane.

[Amdt. 25-23, 35 FR 5674, Apr. 8, 1970]

Subpart D—Design and Construction

GENERAL

§ 25.601 General.

The airplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of each questionable design detail and part must be established by tests.

§ 25.603 Materials.

The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must—

(a) Be established on the basis of experience or tests;

(b) Conform to approved specifications (such as industry or military specifications, or Technical Standard Orders) that ensure their having the strength and other properties assumed in the design data; and

(c) Take into account the effects of environmental conditions, such as temperature and humidity, expected in service.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-38, 41 FR 55466, Dec. 20 1976; Amdt. 25-46, 43 FR 50595, Oct. 30, 1978]

§ 25.605 Fabrication methods.

(a) The methods of fabrication used must produce a consistently sound structure. If a fabrication process (such as gluing, spot welding, or heat treating) requires close control to reach this objective, the process must be performed under an approved process specification.

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(b) Each new aircraft fabrication method must be substantiated by a test program.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-46, 43 FR 50595, Oct. 30, 1978]

§ 25.607 Fasteners.

(a) Each removable bolt, screw, nut, pin, or other removable fastener must incorporate two separate locking devices if—

(1) Its loss could preclude continued flight and landing within the design limitations of the airplane using normal pilot skill and strength; or

(2) Its loss could result in reduction in pitch, yaw, or roll control capability or response below that required by Subpart B of this chapter.

(b) The fasteners specified in paragraph (a) of this section and their locking devices may not be adversely affected by the environmental conditions associated with the particular installation.

(c) No self-locking nut may be used on any bolt subject to rotation in operation unless a nonfriction locking device is used in addition to the self-locking device.

[Amdt. 25-23, 35 FR 5674, Apr. 8, 1970]

§ 25.609 Protection of structure.

Each part of the structure must—

(a) Be suitably protected against deterioration or loss of strength in service due to any cause, including—

(1) Weathering;

(2) Corrosion; and

(3) Abrasion; and

(b) Have provisions for ventilation and drainage where necessary for protection.

§ 25.611 Accessibility provisions.

Means must be provided to allow inspection (including inspection of principal structural elements and control systems), replacement of parts normally requiring replacement, adjustment, and lubrication as necessary for continued airworthiness. The inspection means for each item must be practicable for the inspection interval for the item. Nondestructive inspection aids may be used to inspect structural elements where it is impracticable to

provide means for direct visual inspection if it is shown that the inspection is effective and the inspection procedures are specified in the maintenance manual required by § 25.1529.

[Amdt. 25-23, 35 FR 5674, Apr. 8, 1970]

§ 25.613 Material strength properties and design values.

(a) Material strength properties must be based on enough tests of material meeting approved specifications to establish design values on a statistical basis.

(b) Design values must be chosen to minimize the probability of structural failures due to material variability. Except as provided in paragraph (e) of this section, compliance with this paragraph must be shown by selecting design values which assure material strength with the following probability:

(1) Where applied loads are eventually distributed through a single member within an assembly, the failure of which would result in loss of structural integrity of the component, 99 percent probability with 95 percent confidence.

(2) For redundant structure, in which the failure of individual elements would result in applied loads being safely distributed to other load carrying members, 90 percent probability with 95 percent confidence.

(c) The effects of temperature on allowable stresses used for design in an essential component or structure must be considered where thermal effects are significant under normal operating conditions.

(d) The strength, detail design, and fabrication of the structure must minimize the probability of disastrous fatigue failure, particularly at points of stress concentration.

(e) Greater design values may be used if a "premium selection" of the material is made in which a specimen of each individual item is tested before use to determine that the actual strength properties of that particular item will equal or exceed those used in design.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-46, 43 FR 50595, Oct. 30, 1978; Amdt. 25-72, 55 FR 29776, July 20, 1990]

§ 25.619 Special factors.

The factor of safety prescribed in § 25.303 must be multiplied by the highest pertinent special factor of safety prescribed in §§ 25.621 through 25.625 for each part of the structure whose strength is—

- (a) Uncertain;
- (b) Likely to deteriorate in service before normal replacement; or
- (c) Subject to appreciable variability because of uncertainties in manufacturing processes or inspection methods.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-23, 35 FR 5674, Apr. 8, 1970]

§ 25.621 Casting factors.

(a) *General.* The factors, tests, and inspections specified in paragraphs (b) through (d) of this section must be applied in addition to those necessary to establish foundry quality control. The inspections must meet approved specifications. Paragraphs (c) and (d) of this section apply to any structural castings except castings that are pressure tested as parts of hydraulic or other fluid systems and do not support structural loads.

(b) *Bearing stresses and surfaces.* The casting factors specified in paragraphs (c) and (d) of this section—

(1) Need not exceed 1.25 with respect to bearing stresses regardless of the method of inspection used; and

(2) Need not be used with respect to the bearing surfaces of a part whose bearing factor is larger than the applicable casting factor.

(c) *Critical castings.* For each casting whose failure would preclude continued safe flight and landing of the airplane or result in serious injury to occupants, the following apply:

(1) Each critical casting must—

(i) Have a casting factor of not less than 1.25; and

(ii) Receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods or approved equivalent nondestructive inspection methods.

(2) For each critical casting with a casting factor less than 1.50, three sample castings must be static tested and shown to meet—